

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister's delegate approved this Conservation Advice on 01/04/2016.

Conservation Advice

Grevillea curviloba subsp. *curviloba*

curved-leaf grevillea

Conservation Status

Grevillea curviloba subsp. *curviloba* (curved-leaf grevillea) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). The species is eligible for listing as prior to the commencement of the EPBC Act, it was listed as Endangered under Schedule 1 of the *Endangered Species Protection Act 1992* (Cwlth).

The main factors that are the cause of the species being eligible for listing in the Endangered category are its geographic distribution is precarious for its survival due to its restricted extent of occurrence and area of occupancy and low number of locations, with a projected continuing decline in quality of habitat.

Grevillea curviloba subsp. *curviloba* is listed as Declared Rare Flora and ranked as Critically Endangered under the *Western Australian Wildlife Conservation Act 1950*.

Description

The curved-leaf grevillea is extremely variable in form. It can occur as a prostrate shrub with broad dark green leaves, or a tall erect shrub to 2 m tall with greyish green leaves (English & Phillimore 2000).

The curved-leaf grevillea leaves are 1.5–5 cm long with mostly oval, wedge-shaped lobes cut about half way to the mid rib. The inflorescences are 1–3 cm long and 3 cm wide. The flowers occur on short stalks, usually in the leaf axils, and appear September to October. The creamy-white individual flowers are 7–10 mm long by 0.5 mm across. The fruits are 10–13 mm long and 6–9 mm wide with a wrinkled surface. The shiny seed is 7–9 mm long by 3–3.5 mm wide (Brown et al., 1998; Olde & Marriott 1995).

The curved-leaf grevillea differs from the narrow curved-leaf grevillea (*G. curviloba* subsp. *incurva*) in having broader, slightly cupped primary leaf lobes that are generally more than 1.5 mm wide, rather than leaf lobes that are narrow and prominently incurved (Brown et al., 1998).

Distribution

The curved-leaf grevillea is geographically restricted, with an estimated extent of occurrence in 2000 of less than 20 km², in the Muchea-Bullsbrook area of Western Australia (English & Blyth 2000). There are five populations: two on shire road and rail reserves (Populations 1 and 5), which contained 135 mature individuals in 1999–2000, and three on a private property (Populations 2–4), which contained 73 mature individuals in 1998–2000 (English & Phillimore 2000).

Relevant Biology/Ecology

The curved-leaf grevillea occurs on typically winter wet, deep peaty grey sands over limestone at depth, and occurs with a suite of shrubs including *Acacia saligna*, *Melaleuca huegelii* and *M. systema* ms that are more commonly associated with limestone soils near the coast (English & Blyth 2000).

While the biology of many grevillea species is well researched, the biology of the curved-leaf grevillea is poorly known. Like many other grevilleas, this species regenerates from soil-stored seed, but has also been observed to resprout from root stock after fire or loss of foliage by other means such as grazing and slashing. It is pollinated by insects, possibly native bees (Olde & Marriott 1995).

The curved-leaf grevillea is relatively hardy in most conditions but has not been widely cultivated for the horticultural industry (Olde & Marriott 1995).

The curved-leaf grevillea is associated with the 'Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain' ecological community, which is listed as Endangered under the EPBC Act, as the habitat has been mostly cleared for agriculture and the remaining area is under threat from weed invasion, clearing, and too frequent fires (English & Blyth 2000).

Threats

Table 1 – Threats

Threat factor	Threat type	Threat status	Evidence base
Invasive species (including threats from grazing, trampling)			
Weed invasion	known	current	Weeds occurring in all populations suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many grass weed species.
Trampling	known potential	current future	This threat by walkers is evident throughout the habitat at Population 2. The area is adjacent to a housing development, and is used as a recreation area by local residents. Further development of the surrounding area is proposed, and this is likely to increase recreational impacts. This is likely to result in increasing degradation of the habitat, weed invasion and possibly increased fire frequency and trampling of plants, unless residents of the local area are provided with information about the significance of the subspecies and the need to manage the habitat.
Habitat loss disturbance and modifications			
Road, rail and firebreak maintenance activities	known	current	These activities threaten plants and habitat at Populations 1 and 5. Disturbance events include grading the road verge, constructing drainage channels and mowing the roadside vegetation to improve visibility. They also often encourage weed invasion into adjacent habitat.
Disease			
Dieback caused by plant pathogens	potential	future	Dieback disease is a threat to the habitat of all populations. Dieback (<i>Phytophthora</i> spp.) are pathogens that cause the roots to rot and result in the plant dying of drought stress. Curved-leaf grevillea populations are inundated over the winter months favouring the establishment and

			spread of Phytophthora species. Although initial testing by CALM Research has found that curved-leaf grevillea may not be susceptible to this pathogen (C. Crane, pers comm.), other species in the habitat may be susceptible and therefore the pathogen has the potential to indirectly impact on the subspecies. The spread of dieback into the area should therefore be prevented.
Fire			
Fire frequency	potential	future	Fire may affect the viability of all populations, as seeds of curved-leaf grevillea probably germinate following fire. If this is the case, the soil seed bank would rapidly be depleted if too-frequent fires occurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. It is likely, however, that occasional fires are needed for reproduction of this species from seed. It is also likely that the subspecies can produce suckers from underground root stock following disturbance such as fire, and this would reduce the adverse impact of frequent fires on populations.

Conservation Actions

Conservation and Management priorities

Invasive species

- Identify and remove new weeds and undertake weed control by appropriate methods such as hand removal or spot spraying around curved-leaf grevillea plants when weeds first emerge. Schedule weed control to include spraying at other threatened flora populations within the district. Consider the possible disturbance/overspray threats associated with the control method.
- Construct and/or maintain walk trails at Population 2 to reduce trampling of curved-leaf grevillea and its habitat. Erect and/or maintain signs that indicate the site is environmentally sensitive and require that users stay on the designated pathways.
- Erect and/or maintain fencing around Populations 3 and 4, which includes a buffer of surrounding habitat, to prevent kangaroos grazing seedlings.

Habitat loss disturbance and modifications

- Protect the species from further loss of habitat as a result of road upgrades, changes in land use, mineral exploration, etc.
- Prevent habitat disturbance. Control access routes to suitably constrain vehicle access in Populations 1 and 5, to prevent grazing and soil disturbance, and vehicle and public access in Population 2 to prevent trampling and spread of dieback disease.
- Ensure land managers are aware of the species' occurrence and provide protection measures against key and potential threats, including road and rail maintenance, weed invasion, fire damage, trampling and spread of dieback disease.

- Maintain Declared Rare Flora (DRF) markers¹ at Populations 1 and 5. Continue producing and distributing dashboard stickers and posters that illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.

Disease

- Implement suitable hygiene protocols to protect known populations from any outbreaks of *Phytophthora megasperma* (DPaW 2014). These should be adhered to for activities such as installation and maintenance of firebreaks and walking into the population in wet soil conditions.

Fire

- Develop and implement a fire management strategy involving fire frequencies and seasons that promote persistence of established plants and opportunities for seedling recruitment.
- Any use of prescribed or experimental fires must be justified, in an adaptive management framework involving objectives of both learning and management. Prescribed fire operations should be integrated into an experimental design and a monitoring program.
- Provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigation measures in bush fire risk management plan/s, risk register and/or operation maps.

Breeding, propagation and other ex-situ recovery action

- Continue seed and cutting collections to establish a living collection of genetic material at the Botanic Garden and Parks Authority for future translocations.

Stakeholder Engagement

- Continue to liaise with relevant land managers and private landowners, including managers of land adjacent to all populations, to ensure the populations are not accidentally damaged or destroyed.
- Encourage local volunteers, such as members of naturalists clubs and wildflower societies, to be involved in surveys supervised by DPAW staff.
- Continue to raise awareness of the curved-leaf grevillea with the public by providing posters that include a description of the subspecies and information about threats and recovery actions, to assist in discovery of new populations.
- Continue negotiations with landowners to establish conservation reserves at the site of Populations 3 and 4, and Public Open Space at Population 2.

Survey and Monitoring priorities

- Continue to monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Monitor weed invasion, habitat degradation (including the impact of dieback), salinity levels and population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity annually.
- Investigate options for linking, enhancing or establishing additional populations.

¹ DRF markers are used in Western Australia and are two standardised yellow markers at either end of a site, which are bent to face towards each other, indicating that DRF plants may occur anywhere between the markers, from the road's running surface to the fence. They alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage vegetation in the area (DEC 2013).

- Undertake survey work during the species' flowering period (September to October) in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants, and to more precisely assess population size and distribution.

Information and research priorities

- Research the species' response to fire using observational methods and laboratory experiments that have minimal impacts on the species population and its habitat.
- Undertake seed germination trials to determine seed dormancy mechanisms and the requirements for successful establishment.
- Evaluate the outcomes of citizen science monitoring programs where they exist.
- Study the soil seed bank dynamics and the role of various factors including disturbance, competition, rainfall and grazing in recruitment and seedling survival.
- Determine reproductive strategies, phenology and seasonal growth.
- Investigate of the mating system and pollination biology.
- Investigate population genetic structure and levels of genetic diversity.
- Investigate the impacts of dieback disease and control techniques on the curved-leaf grevillea and its habitat.
- Research the tolerance of associated native plant species to herbicides at the site of curved-leaf grevillea in conjunction with weed control programs.

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